

*A REVIEW OF COCAINE ABUSE: BEHAVIOR,
PHARMACOLOGY, AND CLINICAL APPLICATIONS,
EDITED BY S. T. HIGGINS AND J. L. KATZ*

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This book comprises 17 chapters that deal with a variety of topics related to cocaine and its abuse. Several of the chapters are excellent, and the book in its totality contains a wealth of information. These are major strengths. On the down side, some important topics are ignored, the relevance of several chapters to cocaine *abuse* is not apparent, and the various chapters are not well integrated. We recommend *Cocaine Abuse* as a reference volume for scientists with specific training in the areas that it covers. But we do not recommend it for cover-to-cover reading as an overview of cocaine abuse.

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Cocaine Abuse: Behavior, Pharmacology, and Clinical Applications (Higgins & Katz, 1998) is an edited text comprising 17 chapters, all written by experts in the topics addressed. The chapters are grouped into three sections. The first section, chapters 1 through 6, considers preclinical research on cocaine. The second section, chapters 7 through 12, examines the clinical pharmacology of cocaine. In the final section, chapters 13 through 17, models of individual vulnerability to cocaine abuse and relapse are presented, treatments for cocaine abuse are summarized, and cocaine legalization is discussed. The book is 445 pages in length and includes a good index. According to its editors, Higgins and Katz,

We believe this volume offers a coherent, empirically based conceptual framework for addressing cocaine abuse that has continuity from the basic research laboratory through the clinical and policy arenas. Each chapter was

prepared with the goal of being sufficiently detailed, in-depth, and current to be valuable to informed readers with specific interests while also offering a comprehensive overview for those who might be less informed or have broader interests in cocaine abuse. We hope this blend of critical review with explicit conceptual continuity that spans all of the chapters will make this volume a unique contribution to cocaine abuse in particular and substance abuse in general. (p. xxiv)

Insofar as no other book contains the same breadth and depth of current information, *Cocaine Abuse* undoubtedly is a unique contribution to the literature. For that same reason, it is a uniquely valuable contribution. We know of no better source of reference material for individuals interested in a wide range of topics relevant to cocaine abuse. In the years to come, *Cocaine Abuse* will be widely cited, and rightly so. Nonetheless, there are problems with the book when its value for applied behavior analysts, clinical psychologists, and others with a general interest in cocaine abuse is considered. Those problems become evident when the contents of individual chapters are considered.

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Chapter 1, by Izenwasser, provides an overview of the neurochemical actions of cocaine, and indicates that the inhibition of dopamine reuptake appears to be cocaine's primary mechanism of action. The methods used to delineate this mechanism of action are not described in sufficient detail to be understandable to readers who are not neuroscientists, and there is no discussion of how knowledge of cocaine's neurochemical effects is relevant to cocaine abuse.

In chapter 2, Caine describes neuroanatomical structures that appear to be related to reinforcing, and certain other, effects of cocaine. The author summarizes a sizable literature indicating that the mesoaccumbens dopamine pathway is important in mediating the reinforcing effects of cocaine, but fails to address the relevance of this knowledge to cocaine abuse. Although this might be obvious to neuroscientists, other people need to be informed specifically as to how knowledge of a drug's neurochemical effects—or, for that matter, of other aspects of its preclinical pharmacology—are relevant to preventing and treating drug abuse.

Chapter 3, by Bergman and Katz, summarizes the behavioral pharmacology of cocaine. Although its authors are appropriately cautious, as in considering the relevance of nonhuman priming experiments to cocaine relapse in humans, a major strength of this chapter is consistent discussion of the possible significance of basic research findings for understanding cocaine *abuse* in humans. A second major strength is that, by outlining the variables that influence cocaine self-administration, its authors disabuse readers of the notion that cocaine is an overwhelmingly powerful reinforcer and is abused for that reason. The research methods described in this chapter were relatively easy for us to understand, but we are trained in behavior analysis. People who are not so trained probably will have difficulty in making sense of them.

Carroll and Bickel wrote chapter 4, which deals specifically with variables that influence cocaine self-administration. Many such variables have been examined in laboratory settings; results of much of this work are summarized accurately here. In most cases, however, possible implications for understanding, preventing, or treating cocaine abuse are not spelled out. For example, over three pages are devoted to a discussion of behavioral economics. Yet there is no mention of how, given what is known about the elasticity of demand for cocaine, changing the price of cocaine should affect human consumption. As a second example, the authors indicate that "stress" increases cocaine self-administration in laboratory animals, but there is no discussion of the possible role of stress in humans' abuse of cocaine. One leaves this chapter with a better knowledge of the variables that modulate cocaine self-administration, but with no notion of the practical significance of those variables. As with chapter 3, we understood most of the experimental methods described here, but those without training in behavioral pharmacology may not.

Chapter 5 examines tolerance and sensitization to cocaine. This is an important topic, because under some conditions the effects of cocaine increase with repeated exposure (sensitization), but under other conditions, they decrease (tolerance). In this chapter, Woolverton and Weiss address both neurochemical and behavioral effects of cocaine and offer a general model of how tolerance and sensitization might contribute to cocaine abuse. The chapter is informative in that the results of a substantial number and variety of studies are accurately summarized. On the down side, the model of cocaine abuse presented does not appear to be sufficiently specific to be of value in predicting the conditions under which cocaine abuse is likely to occur or in suggesting treatment strategies.

Chapter 6, by Winger, addresses preclinical research with humans in which possible pharmacotherapies for cocaine abuse were evaluated under self-administration and drug-discrimination assays. In short, dopamine agonists, dopamine antagonists, and dopamine reuptake inhibitors have not yielded especially promising results in these studies, which use methods that are clearly described and easy to understand. However, as Winger makes clear in considering the effects of established pharmacotherapies for opioid (e.g., heroin) abuse under such procedures, care is justified in interpreting these results. This is a nice chapter, clearly written, appropriately cautious, and focused on drug abuse.

Schama, Howell, and Byrd report on the effects of prenatal exposure to cocaine in chapter 7. Findings with humans and non-humans are reported in a clear and easy-to-understand fashion, and the authors do not hesitate to draw conclusions where appropriate. Apparently, prenatal exposure to cocaine is not as harmful as researchers once thought it to be. Nonetheless, as the authors point out, further research on the effects of various patterns of maternal intake are needed. This is another good chapter. It contains a substantial amount of information presented accurately, yet so lucidly that no training in teratology is required to appreciate it.

In chapter 8, Fischman and Foltin examine cocaine self-administration by humans in laboratory settings. Variables that influence research methods are addressed at some length, which is of value for readers not trained in behavioral pharmacology or psychopharmacology. Also of value to such readers is the discussion of the relation between "craving" for cocaine and cocaine self-administration, which is weak and apparently not causal. Considerable space is devoted to the effects of possible pharmacotherapeutic agents for cocaine abuse. Several such

agents were covered earlier in the book (chap. 6), and the reader begins to wonder if a unified chapter dealing with pharmacotherapies is needed. Of course, this concern does not detract from the merit of this chapter, which is substantial.

Chapter 9 also deals with potential pharmacotherapies; it was written by Bigelow and Walsh. Unlike chapter 8, which examines cocaine self-administration, the primary focus is on studies measuring subjective and physiological responses to cocaine. The methods used in such studies are described with precision, as are their results, which are thus far negative insofar as no effective pharmacological treatment for cocaine abuse has been discovered. A good chapter in and of itself, but why does the book provide so much coverage of pharmacotherapies? And why do the authors of chapter 8 indicate that laboratory studies are known to be effective for detecting pharmacotherapies for drugs other than cocaine, while the author of chapter 6 points out the limitations of such studies with respect to methadone treatment of heroin abuse? A small issue that could be easily resolved, perhaps, but one that calls into question the continuity of the various chapters. We wonder: Did authors of related chapters read one another's contributions?

Chapter 10 reports on laboratory studies with humans in which the effects of cocaine in combination with other abused drugs were examined. Relatively few studies have appeared; those that have are clearly summarized by the authors, Rush, Roll, and Higgins, and possible implications for cocaine abuse are considered. "Nicely done" is a good summary of this chapter.

In chapter 11, Lukas and Renshaw summarize the effects of cocaine on electrical activity in the brain. Although these effects become apparent to the reader, and the methods used to obtain them are explained, the relevance of this line of research to cocaine

abuse is not clear—at least, not to us. Nor is it clear why this chapter was included in the section of the book (chap. 7 through 12) dealing with clinical, not preclinical (chap. 1 through 6), pharmacology.

Chapter 12 addresses the role of genetic factors in cocaine and other drug abuse. Its authors, Elmer, Miner, and Pickens, ably describe (a) techniques used by behavioral geneticists, (b) findings concerning the contribution of genotype to substance abuse in general and cocaine abuse in particular, and (c) environmental variables that influence drug use and abuse. Although relatively few studies have explored the role of genotype in cocaine use or abuse, this chapter is informative and up to date.

Chapter 13 provides a comprehensive model for conceptualizing cocaine use and abuse. With components from epidemiology and behavioral pharmacology, the model, which the authors support with data from several research areas, accounts for how a wide range of variables might contribute to an individual's susceptibility to cocaine abuse. The model is generally easy to understand, and so is the chapter (a minor exception is the reporting of survival analysis results without explanation of procedures). This chapter, authored by Chilcoat and Johanson, is one of our favorites and would have been a good opening for the book.

Higgins and Wong summarize the cocaine abuse treatment literature in chapter 14. Several intervention strategies are described, although in little detail, and results with those strategies are compared. In general, reinforcement-based procedures appear to be most effective, although other strategies also are promising. The effects of pharmacological treatments, already covered too many times in prior chapters, are summarized here. A worthwhile chapter, even though it contains too little information to be truly useful to practitioners interested in treating cocaine abusers.

Chapter 15, by Silverman, Bigelow, and Stitzer, describes the treatment of cocaine abuse in methadone maintenance patients. The chapter will make sense to any educated person. It provides a comprehensive listing of relevant studies, as well as an informative summary of their findings. Absent, however, is discussion of how treating cocaine abuse in methadone maintenance patients might differ from treating cocaine abuse in other patients. Although this is not a criticism of chapter 15, we wonder why an entire chapter was devoted to methadone maintenance patients, but no special coverage was given to other patient groups.

Chapter 16 addresses relapse to cocaine use. A number of theoretical models of relapse are described, and variables that predict susceptibility to relapse are considered. As in chapter 8, the role of "craving" in cocaine abuse is considered and generally dismissed as a primary causal factor. The chapter, written by Hall, Wasserman, Havassy, and Maude-Griffin, is easy to comprehend, but the contribution of its contents to preventing or treating cocaine abuse is not readily apparent.

Crowley and Brewster consider possible ramifications of cocaine legalization in chapter 17. The chapter is straightforward and thought provoking but, given that there is no great hue and cry for the legalization of cocaine, it appears out of place in the book.

Obviously, *Cocaine Abuse* covers an impressive amount of material. But, despite the book's breadth, some important topics are given short shrift. We expected to find careful analysis of the kinds of problems that are characteristically experienced by cocaine abusers and people affected by them, but did not. The book's endplate indicates that, "Cocaine abuse remains a major public health problem and contributes to many of our most distressing social problems, including the spread of infectious disease, crime, violence, and neonatal drug exposure." With

the exception of the effects of neonatal exposure, which are covered beautifully in chapter 7, none of these problems is given adequate attention. A chapter describing the prevalence of cocaine use, the demographic characteristics of typical users, common patterns of cocaine use, and the problems associated with those patterns would help readers to understand what "cocaine abuse" actually entails.

Given that a great deal of money is spent in attempting to prevent cocaine abuse, we also expected that substantial space would be devoted to this topic. It is not. Nonetheless, *Cocaine Abuse* does provide a great deal of information relevant to cocaine abuse. Unfortunately, and contrary to the desires of its editors, the authors of the various chapters do not approach the topic with continuity. The chapters are not interrelated in any obvious way, and some of them are related tangentially, if at all, to cocaine abuse. Although all of the chapters are to a greater or lesser extent data based, no conceptual framework ties them together. Several of the authors are knowledgeable behavior analysts, as are the editors, but most of the chapters are not written from a behavior-analytic perspective. Certainly behavior analysis is not the conceptual framework that unites the book. For us, as behavior analysts, this came as a disappointment.

Equally disappointing, although this is not a shortcoming of the book, is the absence of behavior-analytic research methodology in the studies reviewed in the chapters that addressed treatment. Conspicuous by their absence in this literature are experiments using within-subject designs and the general methods characteristic of research in applied behavior analysis. Instead, one finds between-subjects designs yielding group means that are compared via inferential statistics. Although such methods can be valuable, they are not optimal for determining whether individuals derive meaningful ben-

efits from particular treatments, or for ascertaining the variables that influence the effectiveness of those treatments (e.g., Johnston & Pennypacker, 1993). Nor are they optimal for extracting valuable information from a small number of subjects.

A final disappointment also reflects not on the book per se, but on research and theory in substance abuse. For over 30 years, many influential behavior analysts have emphasized that the behavior of verbal humans can be controlled by descriptions of relations among stimuli and responses, which are often called rules, as well as by actual exposure to those relations (e.g., Skinner, 1969). Rules allow events that individuals have not actually encountered, as well as events too small or delayed to affect behavior directly, to control responding. There is good evidence that rules can influence drug self-administration, and there is speculation (e.g., Poling & LeSage, 1992) that rule-governed behavior determines, in part, whether people use drugs at all and, if they do, whether they abuse them. Some of the variables that predict cocaine abuse (e.g., neighborhood, degree of parental monitoring and involvement) may to some degree exert their influence by generating different patterns of rule-governed behavior. This possibility surely will be difficult to confirm; attempts to analyze significant behaviors other than drug self-administration in terms of rule governance have generated more arguments than data. Nonetheless, it appears that a thoroughgoing behavioral analysis of drug abuse must incorporate the effects of indirect-acting contingencies, that is, of verbal behavior and rules, as well as the direct effects of drugs and other reinforcers. Whether such an analysis would prove to be especially valuable in fostering effective and efficient strategies for preventing and treating drug abuse is open to argument, but it is noteworthy that behavior-analytic interventions are the best current treatments for cocaine abuse.

Moreover, acceptance and commitment therapy, developed by Hayes and his colleagues (Hayes, Strosahl, & Wilson, 1999), places special emphasis on verbal behavior and appears to have promise as a treatment for the abuse of cocaine and other drugs.

But we have digressed from *Cocaine Abuse*, which rightly focuses on *what has been done* with respect to research and theory, not on what *might or should be done*. So much has been done that it is utterly impossible to provide meaningful coverage of all of it in any single text. Nonetheless, as editors, Higgins and Katz have succeeded in bringing together under one cover expert summaries of many subjects relevant to cocaine abuse. For that reason, and because some of the chapters are superb, we recommend *Cocaine Abuse* as a reference volume for scientists with specific training in the

topics that it covers. But we do not recommend the book for cover-to-cover reading as an overview of cocaine abuse.

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